U.S. DEPARTMENT OF COMMERCE PATENT & TRADEMARK OFFICE 23364

B/O Form PTO-1390 **Transmittal Letter to the United States Designated/Elected Office (DO/EO/US) Concerning a Filing Under *35 USC 371***		*Attorney's Docket Number* MAYE3001/JEK
		U S Application Number (if known) 09/787920
International Application Number PCT/EP99/07217	*International Filing Date* 29 September 1999	*Priority Date Claimed* 02 October 1998
Title of Invention GRAVURE PROCESS FOR FULL PRINTING OF LARGE SURFACES		
Applicant(s) for DO/EO/US Karlheinz MAYER et al.		

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items under *35 USC 371*:

1. ☒ This is a **FIRST** submission of items concerning a filing under *35 USC 371*.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under *35 USC 371*.
3. ☒ This express request to begin national examination procedures *(35 USC 371(f))* at any time rather than delay examination until the expiration of the applicable time limit set in *35 USC 371(b)* and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed *35 USC 371(c)(2)*.
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English *(35 USC 371(c)(2))*.
7. ☒ Amendments to the claims of the International Application under PCT Article 19 *(35 USC 371(c)(3))*
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 *(35 USC 371(c)(3))*.
9. ☒ An oath or declaration of the inventor(s) *(35 USC 371(c)(4))*. (☐ Executed ☒ Unexecuted)
10. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 *(35 USC 371(c)(5))*.

Items 11 to 16 below concern other document(s) or information included:

11. ☐ An Information Disclosure Statement under *37 CFR 1.97* and *1.98*.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with *37 CFR 3.28* and *3.31* is included.
13. ☒ A **FIRST** preliminary amendment.
    ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: 3 sheets of formal drawings

Application Number (if Known)	International Application Number	Attorney's Docket Number
09/787920	PCT/EP99/07217	MAYE3001/JEK

	Calculations	PTO USE ONLY
17. The following fees are submitted: **Basic National Fee *(37 CFR 1.492(a)(1)-(5))*:** ☒ Search report has been prepared by the EPO or JPO . . . . . $860.00 ☐ International Preliminary Examination Fee paid to USPTO *(37 CFR 1.482)* . . . . . $690.00 ☐ No International Preliminary Examination Fee paid to USPTO *(37 CFR 1.482)* but International Search Fee paid to USPTO *(37 CFR 1.445(a)(2))* . . . . . $710.00 ☐ Neither International Preliminary Examination Fee *(37 CFR 1.482)* nor International Search Fee *(37 CFR 1.445(a)(2))* paid to USPTO . . . . . $1000.00 ☐ International Preliminary Examination Fee paid to USPTO *(37 CFR 1.482)* and all claims satisfied provisions of PCT Article 33(1)-(4) $100.00		
ENTER APPROPRIATE BASIC FEE AMOUNT	**$ 860.00**	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date *(37 CFR 1.492(e))*.		

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	72 -20 =	52	× $18.00	$ 936.00	
Independent Claims	3 -3 =		× $80.00		
Multiple Dependent Claims (if applicable)			+ $270.00		
			TOTAL OF ABOVE CALCULATIONS	**$ 1,796.00**	
Reduction by ½ for filing by small entity, if applicable. Small Entity Status is asserted pursuant to 37 CFR 1.27 for this application.					
			SUBTOTAL	**$ 1,796.00**	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date *(37 CFR 1.492(f))*.					
			TOTAL NATIONAL FEE	**$ 1,796.00**	
Fee for recording the enclosed assignment *(37 CFR 1.21(h))*. The assignment must be accompanied by an appropriate cover sheet *(37 CFR 3.28, 3.31)*. **$40.00** per property.					
			TOTAL FEES ENCLOSED	**$ 1,796.00**	
			Amount to be: Refunded:		
			Charged:		

a. ☒ A check in the amount of **$1,796.00** to cover the fees is enclosed.

b. ☐ Please charge my **Deposit Account Number 02-0200** in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to **Deposit Account Number 02-0200**. A duplicate copy of this sheet is enclosed.

Note: Where an appropriate time limit under *37 CFR 1.494* or *1.495* has not been met, a petition to revive *(37 CFR 1.137(a) or (b))* must be filed and granted to restore the application to pending status.

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DATE: 02 April 2001

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

International Patent Application
No. PCT/EP99/07217

PCT/DO/EO/US

International Filing Date: 29 September 1999

Applicant: Karlheinz MAYER et al.

For: GRAVURE PROCESS FOR FULL PRINTING OF LARGE SURFACES

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

This paper accompanies documents submitted to establish the U.S. national stage of the above-identified international patent application.

The international patent application was amended under PCT Article 34 and the claims as-amended are annexed to the International Preliminary Examination Report (IPER).

Before calculation of the filing fee and before examination, please amend the application as follows:

IN THE CLAIMS:

Please amend the claims as amended under Article 34 on November 28, 2000 as shown on the appended APPENDIX OF CLAIMS, which includes amended and non-amended claims. Also appended hereto an APPENDIX OF MARKED UP CLAIMS showing the changes which have been made.

REMARKS

All rights are reserved to the original claimed subject matter. The claims have been amended to reduce the filing fees and to better conform to U.S. claim format. Examination of the application as amended is respectfully requested.

Respectfully submitted,
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Date: April 2, 2001

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APPENDIX OF CLAIMS

1(Amended). An intaglio printing plate for all-over printing of contiguous printed image areas, the printed image being incorporated into the printing plate surface in the form of an engraving, comprising partitions provided in engraved, ink-receiving areas of the printing plate surface so as to divide said engraved areas into partial areas, said partitions being configured so as not to have any areas at the level of the printing plate surface.

2(Amended). The printing plate according to claim 1, wherein the engraved areas are engraved lines and/or large-area engraved elements.

3(Amended). The printing plate according to claim 2, wherein the engraved lines are wider than 0.5 millimeters, and preferably wider than 1.0 millimeter.

4(Amended). The printing plate according to claim 1, wherein the engraved areas are engraved lines, and the partitions extend transversely to the engraved lines so as to form adjacent partial portions, and the partitions extend transversely or diagonally to the wiping direction.

5(Amended). The printing plate according to claim 1, wherein the engraved areas are engraved lines, and the partitions extend parallel to the engraved line and transversely or diagonally to the wiping direction.

6(Amended). The printing plate according to claim 1, wherein the partitions are disposed in the engraved area so as to form a uniform fine structure in the form of a screen or regular pattern.

7(Amended). The printing plate according to claim 1, wherein the screen is a line screen or cross-line screen.

8(Amended). The printing plate according to claim 7, wherein the cross-line screen comprises a first engraving with parallel, preferably straight, engraved lines and a second engraving with parallel, preferably straight, engraved lines superimposed on the first engraving.

9(Amended). The printing plate according to claim 8, wherein the lines of the first and second engravings form with each other an angle between 20° and 90°, and preferably 40° to 70°.

10(Amended). The printing plate according to claim 1, wherein the upper edges of the partitions are disposed at a mutual distance which is greater than or equal to the contact width of an engraving tool used for engraving the engraved area.

11(Amended). The printing plate according to claim 10, wherein the mutual distance of the upper edges of the partitions is smaller than 500 microns.

12(Amended). The printing plate according to claim 11, wherein the mutual distance of the upper edges of the partitions is 20 microns to 150 microns.

13(Amended). The printing plate according to claim 12, wherein the mutual distance of the upper edges of the partitions is 50 microns.

14(Amended). The printing plate according to claim 13, wherein the upper edges of the partitions have a lowering of at least 2 microns to 5 microns over the printing plate surface.

15(Amended). The printing plate according to claim 14, wherein the partitions have a partition height in the range of 3 microns to 150 microns.

16(Amended). The printing plate according to claim 15, wherein the partition height is in the range of 8 microns and 60 microns.

17(Amended). The printing plate according to claim 15, wherein the ratio between partition height and engraving depth is in the range of 0.5 to 1.

18(Amended). The printing plate according to claim 1, wherein the engraving depth is between 5 microns and 150 microns.

19(Amended). The printing plate according to claim 18, wherein the engraving depth is between 10 microns and 60 microns.

20(Amended). The printing plate according to claim 1, wherein the partitions have flanks with flank angles in the range of 15° to 60° relative to the perpendicular to the printing plate surface.

21(Amended). The printing plate according to claim 20, wherein the partitions have flanks with flank angles in the range of 30° to 50°.

22(Amended). The printing plate according to claim 1, wherein the partitions form a linear fine structure through their parallel arrangement.

23(Amended). The printing plate according to claim 22, wherein the printing plate is adapted for use with a rotary printing cylinder having an axis of rotation such that the linear fine structure is substantially parallel to the rotation axis of the printing cylinder.

24(Amended). The printing plate according to claim 1, wherein both the length and the width of the engraved area are more than one millimeter.

25(Amended). The printing plate according to claim 1, wherein at least a first engraved area and a second engraved area are provided which differ by different designs of the partitions and/or partition arrangements.

26(Amended). The printing plate according to claim 25, wherein the partitions in the first engraved area have a different orientation from the partitions in the second engraved area.

27(Amended). The printing plate according to claim 26, wherein the partitions in the first engraved area are aligned at right angles to the partitions in the second engraved area.

28(Amended). The printing plate according to claim 25, wherein the first engraved area has a different engraving depth from the second engraved area.

29(Amended). The printing plate according to claim 25, wherein the upper edges of the partitions in the first engraved area have a greater mutual distance than the upper edges of the partitions in the second engraved area.

30(Amended). The printing plate according to claim 25, wherein the upper edges of the partitions in the second engraved area have a greater distance from the printing plate surface than the upper edges of the partitions in the first engraved area.

31(Amended). The printing plate according to claim 25, wherein the first and second engraved areas adjoin each other.

32(Amended). A data carrier with a printed image produced by the intaglio printing process and comprising at least one printed image area having an ink layer and a surface area of more than one square millimeter, the at least one ink layer covering the complete printed image area, wherein the lateral dimensions such as length and width of the area are greater than 0.5 millimeters and the ink layer has along one direction at least one notch on which the ink layer thickness passes through a minimum.

33(Amended). The data carrier according to claim 32, wherein the lateral dimensions such as length and width of the area are greater than one millimeter.

34(Amended). The data carrier according to claim 32, including a surface relief of the at least one ink layer, the surface relief having a fine structure with regularly recurring structural elements.

35(Amended). The data carrier according to claim 34, wherein the structural elements recur at a distance smaller than 0.5 millimeters.

36(Amended). The data carrier according to claim 34, wherein the fine structure forms a screen or regular pattern.

37(Amended). The data carrier according to claim 36, wherein the screen is a line screen or cross-line screen.

38(Amended). The data carrier according to claim 36, wherein the fine structure forms a screen wherein the line width is less than 150 microns.

39(Amended). The data carrier according to claim 34, including at least a first printed image area with a first fine structure and a second printed image area with a second fine structure different from the first fine structure.

40(Amended). The data carrier according to claim 39, wherein the first and second printed image areas represent one or more characters or a picture.

41(Amended). The data carrier according to claim 39, wherein the fine structure of the first printed image area has a different orientation from the fine structure of the second printed image area.

42(Amended). The data carrier according to claim 39, wherein the fine structures of the first and the second printed image areas differ by different line widths.

43(Amended). The data carrier according to claim 39, wherein the first and second printed image areas differ by different ink layer thicknesses.

44(Amended). A method for producing an intaglio printing plate for all-over printing of a large area by the intaglio printing process comprising the steps of:

providing a printing plate with a printing plate surface, and

engraving at least one engraved area corresponding to the large area to be printed into the printing plate surface by means of an engraving tool so as to leave partitions rising up in the engraved area and dividing the engraved area into partial areas, the partitions being configured by the engraving so as not to have any areas at the level of the printing plate surface face.

45(Amended). The method according to claim 44, wherein the engraved areas are engraved as engraved lines and/or large-area engraved elements.

46(Amended). The method according to claim 45, wherein the engraved lines are wider than 0.5 millimeters, preferably wider than 1.0 millimeter.

47(Amended). The method according to claim 44, wherein the engraved areas are engraved as engraved lines, and the partitions extend transversely to the engraved line so as to form adjacent partial portions, and the partitions extend transversely or diagonally to the wiping direction.

48(Amended). The method according to claim 44, wherein the engraved areas are engraved as engraved lines, and the partitions are formed parallel to the engraved line and extend transversely or diagonally to the wiping direction.

49(Amended). The method according to claim 44, wherein the partitions form a uniform fine structure in the form of a screen or regular pattern.

50(Amended). The method according to claim 49, wherein the screen is a line screen, dot screen or cross-line screen.

51(Amended). The method according to claim 50, wherein the cross-line screen is formed of a first engraving with parallel, preferably straight, engraved lines and a second engraving with parallel, preferably straight, engraved lines superimposed on the first engraving.

52(Amended). The method according to claim 51, wherein the lines of the first and second engravings form with each other an angle between 20° and 90°, and preferably 40° to 70°.

53(Amended). The method according to claim 44, wherein the partitions are produced with flank angles in the range of 15° to 60° based on the perpendicular to the printing plate surface.

54(Amended). The method according to claim 53, the partitions are produced with flank angles in the range of 30° to 50°.

55(Amended). The method according to claim 53, including using an engraving tool with a corresponding flank angle for engraving.

56(Amended). The method according to claim 55, including using a tapered rotating chisel for engraving.

57(Amended). The method according to claim 44, wherein a first engraving is engraved into the printing plate surface, and a second engraving is engraved into the printing plate surface adjacent to the first engraving so as to leave between the first and second engravings a partition tapering at the level of the printing plate surface or slightly therebelow.

58(Amended). The method according to claim 44, wherein 2 microns to 5 microns of the printing plate surface material is removed in the engraved area before or after producing partitions.

59(Amended). The method according to claim 44, wherein the mutual maximum distance of the partitions is smaller than 500 microns.

60(Amended). The method according to claim 59, wherein the mutual maximum distance of the partitions is 20 microns to 150 microns.

61(Amended). A method according to claim 44, wherein partitions with different heights are provided within an engraving.

62(Amended). The method according to claim 44, wherein the engraved area engraved into the printing plate surface has an engraving depth in the range of 5 microns to 150 microns.

63(Amended). The method according to claim 62, wherein the engraving depth is in the range of 10 microns to 60 microns.

64(Amended). The method according to claim 49, wherein the partitions form a linear fine structure through their parallel arrangement.

65(Amended). The method according to claim 49, wherein a first fine structure is engraved in at least a first engraved area, and a second fine structure different from the first fine structure is engraved in at least a second engaved area.

66(Amended). The method according to claim 65, wherein the partitions in the first engraved area are produced with a different orientation from the partitions in the second engraved area.

67(Amended). The method according to claim 66, wherein the partitions in the first engraved area are aligned at right angles to the partitions in the second engraved area.

68(Amended). The method according to claim 65, wherein the first engraved area is engraved with a different engraving depth from the second engraved area.

69(Amended). The method according to claim 65, wherein the partitions in the first engraved area are disposed at a greater maximum mutual distance than the partitions in the second engraved area.

70(Amended). The method according to claim 65, wherein the partitions in the first engraved area are disposed at a greater maximum mutual distance than the partitions in the second engraved area.

71(Amended). The method according to claim 65, wherein the upper edges of the partitions in the first engraved area are produced at a greater distance from the printing plate surface than the upper edges of the partitions in the first engraved area.

72(Amended). An intaglio printing process for all-over printing of contiguous printed areas using a printing plate according to claim 1.

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APPENDIX OF MARKED UP CLAIMS

1(Amended). An intaglio printing plate [(1)] for all-over printing of contiguous printed image areas, the printed image being incorporated into the printing plate surface [(2)] in the form of an engraving [(3)], [characterized in that] comprising partitions [(4) are] provided in [the] engraved, ink-receiving areas of the printing plate surface so as to divide said engraved areas into partial areas, said partitions [(4)] being [designed] configured so as not to have any areas at the level of the printing plate surface.

2(Amended). [A] The printing plate according to claim 1, [characterized in that] wherein the engraved areas are engraved lines and/or large-area engraved elements.

3(Amended). [A] The printing plate according to claim 2, [characterized in that] wherein the engraved lines are wider than 0.5 millimeters, and preferably wider than 1.0 millimeter.

4(Amended). [A] The printing plate according to [any of claims 1 to 3, characterized in that] claim 1, wherein the engraved areas are engraved lines, and the partitions [(4)] extend transversely to the engraved [line] lines so as to form adjacent partial portions, and the partitions [(4)] extend transversely or diagonally to the wiping direction.

5(Amended). [A] The printing plate according to [any of claims 1 to 3, characterized in that] claim 1, wherein the engraved areas are engraved lines, and the partitions extend parallel to the engraved line and transversely or diagonally to the wiping direction.

6(Amended). [A] The printing plate according to claim 1, [characterized in that] wherein the partitions [(4)] are disposed in the engraved area so as to form a uniform fine structure in the form of a screen or regular pattern.

7(Amended). [A] The printing plate according to claim 1 [or 6], [characterized in that] wherein the screen is a line screen or cross-line screen.

8(Amended). [A] The printing plate according to claim 7, [characterized in that] wherein the cross-line screen [consists of] comprises a first engraving with parallel, preferably straight, engraved lines and a second engraving with parallel, preferably straight, engraved lines superimposed on the first engraving.

9(Amended). [A] The printing plate according to claim 8, [characterized in that] wherein the lines of the first and second engravings form with each other an angle between 20° and 90°, [in particular] and preferably 40° to 70°.

10(Amended). [A] The printing plate according to [any of claims 1 to 9, characterized in that] claim 1, wherein the upper edges of the partitions [(4)] are disposed at a mutual distance [(*d*)] which is greater than or equal to the contact width of an engraving tool used for engraving the engraved area.

11(Amended). [A] The printing plate according to [any of claims 1 to 10, characterized in that] claim 10, wherein the mutual distance [(*d*)] of the upper edges [(5)] of the partitions is smaller than 500 microns.

12(Amended). [A] The printing plate according to claim 11, [characterized in that] wherein the mutual distance [(*d*)] of the upper edges [(5)] of the partitions [(4)] is 20 microns to 150 microns.

13(Amended). [A] The printing plate according to claim 12, [characterized in that] wherein the mutual distance [(*d*)] of the upper edges [(5)] of the partitions [(4)] is 50 microns.

14(Amended). [A] The printing plate according to [any of claims 1 to 13, characterized in that] claim 13, wherein the upper edges [(5)] of the partitions [(4)] have a lowering [(α)] of at least 2 microns to 5 microns over the printing plate surface [(2)].

15(Amended). [A] The printing plate according to [any of claims 1 to 14, characterized in that] claim 14, wherein the partitions [(4)] have a partition height [(*b*)] in the range of 3 microns to 150 microns.

16(Amended). [A] The printing plate according to claim 15, [characterized in that] wherein the partition height [(*b*)] is in the range of 8 microns and 60 microns.

17(Amended). [A] The printing plate according to claim 15 [or 16], [characterized in that] wherein the ratio [*(b: t)*] between partition height *[(b)]* and engraving depth [(*t*)] is in the range of 0.5 to 1.

18(Amended). [A] The printing plate according to [any of claims 1 to 17, characterized in that] claim 1, wherein the engraving depth *[(t)]* is between 5 microns and 150 microns.

19(Amended). [A] The printing plate according to claim 18, [characterized in that] wherein the engraving depth *[(t)]* is between 10 microns and 60 microns.

20(Amended). [A] The printing plate according to [any of claims 1 to 19, characterized in that] claim 1, wherein the partitions [(4)] have flanks with flank

angles [(α)] in the range of 15° to 60° [based on] relative to the perpendicular to the printing plate surface [(2)].

21(Amended). [A] The printing plate according to claim 20, [characterized in that] wherein the partitions [(4)] have flanks with flank angles [(α)] in the range of 30° to 50°.

22(Amended). [A] The printing plate according to [any of claims 1 to 21, characterized in that] claim 1, wherein the partitions [(4)] form a linear fine structure through their parallel arrangement.

23(Amended). [A] The printing plate according to claim 22, [characterized in that] wherein the printing plate [(1)] is adapted for use with a rotary printing cylinder having an axis of rotation such that the linear fine structure is substantially parallel to the rotation axis of the printing cylinder.

24(Amended). [A] The printing plate according to [any of claims 1 to 23, characterized in that] claim 1, wherein both the length and the width of the engraved area are more than one millimeter.

25(Amended). [A] The printing plate according to [any of claims 1 to 24, characterized in that] claim 1, wherein at least a first engraved area and a second engraved area are provided which differ by different designs of the partitions [(4)] and/or partition arrangements.

26(Amended). [A] The printing plate according to claim 25, [characterized in that] wherein the partitions [(4)] in the first engraved area have a different orientation from the partitions [(4)] in the second engraved area.

27(Amended). [A] The printing plate according to claim 26, [characterized in that] wherein the partitions [(4)] in the first engraved area are aligned at right angles to the partitions [(4)] in the second engraved area.

28(Amended). [A] The printing plate according to [any of claims 25 to 27, characterized in that] claim 25, wherein the first engraved area has a different engraving depth *[(t)]* from the second engraved area.

29(Amended). [A] The printing plate according to [any of claims 25 to 28, characterized in that] claim 25, wherein the upper edges [(5)] of the partitions in the first engraved area have a greater mutual distance *[(α)]* than the upper edges [(5)] of the partitions in the second engraved area.

30(Amended). [A] The printing plate according to [any of claims 25 to 29, characterized in that] claim 25, wherein the upper edges [(5)] of the partitions in the second engraved area have a greater distance *[(α)]* from the printing plate surface [(2)] than the upper edges [(5)] of the partitions in the first engraved area.

31(Amended). [A] The printing plate according to [any of claims 25 to 30, characterized in that] claim 25, wherein the first and second engraved areas adjoin each other.

32(Amended). A data carrier with a printed image produced by the intaglio printing process and comprising at least one printed image area having an ink layer and a surface area of more than one square millimeter, the at least one ink layer covering the complete printed image area, [characterized in that] wherein the lateral dimensions such as length and width of the area are greater than 0.5 millimeters and the ink layer has along one direction at least one notch on which the ink layer thickness passes through a minimum.

33(Amended). [A] The data carrier according to claim 32, [characterized in that] wherein the lateral dimensions such as length and width of the area are greater than one millimeter.

34(Amended). [A] The data carrier according to claim 32 [or 33], [characterized by] including a surface relief of the at least one ink layer, the surface relief having a fine structure with regularly recurring structural elements.

35(Amended). [A] The data carrier according to claim 34, [characterized in that] wherein the structural elements recur at a distance smaller than 0.5 millimeters.

36(Amended). [A] The data carrier according to claim 34 [or 35], [characterized in that] wherein the fine structure forms a screen or regular pattern.

37(Amended). [A] The data carrier according to claim 36, [characterized in that] wherein the screen is a line screen or cross-line screen.

38(Amended). [A] The data carrier according to claim 36 [or 37], [characterized in that] wherein the fine structure forms a screen wherein the line width is less than 150 microns.

39(Amended). [A] The data carrier according to [any of claims 34 to 38, characterized by] claim 34, including at least a first printed image area with a first fine structure and a second printed image area with a second fine structure different from the first fine structure.

40(Amended). [A] The data carrier according to claim 39, [characterized in that] wherein the first and second printed image areas represent one or more characters or a picture.

41(Amended). [A] The data carrier according to claim 39 [or 40], [characterized in that] wherein the fine structure of the first printed image area has a different orientation from the fine structure of the second printed image area.

42(Amended). [A] The data carrier according to [any of claims 39 to 41, characterized in that] claim 39, wherein the fine structures of the first and the second printed image areas differ by different line widths.

43(Amended). [A] The data carrier according to [any of claims 39 to 42, characterized in that] claim 39, wherein the first and second printed image areas differ by different ink layer thicknesses.

44(Amended). A method for producing an intaglio printing plate [(1)] for all-over printing of a large area by the intaglio printing process comprising the steps of:

providing a printing plate with a printing plate surface [(2)], and

engraving at least one engraved area corresponding to the large area to be printed into the printing plate surface [(2)] by means of an engraving tool so as to leave partitions [(4)] rising up in the engraved area and dividing the engraved area into partial areas, the partitions [(4)] being [designed] configured by the engraving so as not to have any areas at the level of the printing plate surface face [(2)].

45(Amended). [A] The method according to claim 44, [characterized in that] wherein the engraved areas are engraved as engraved lines and/or large-area engraved elements.

46(Amended). [A] The method according to claim 45, [characterized in that] wherein the engraved lines are wider than 0.5 millimeters, preferably wider than 1.0 millimeter.

47(Amended). [A] The method according to [any of claims 44 to 46, characterized in that] claim 44, wherein the engraved areas are engraved as engraved lines, and the partitions [(4)] extend transversely to the engraved line so as to form adjacent partial portions, and the partitions extend transversely or diagonally to the wiping direction.

48(Amended). [A] The method according to [any of claims 44 to 46, characterized in that] claim 44, wherein the engraved areas are engraved as engraved lines, and the partitions are formed parallel to the engraved line and extend transversely or diagonally to the wiping direction.

49(Amended). [A] The method according to claim 44, [characterized in that] wherein the partitions [(4)] form a uniform fine structure in the form of a screen or regular pattern.

50(Amended). [A] The method according to claim 49, [characterized in that] wherein the screen is a line screen, dot screen or cross-line screen.

51(Amended). [A] The method according to claim 50, [characterized in that] wherein the cross-line screen is formed of a first engraving with parallel, preferably straight, engraved lines and a second engraving with parallel, preferably straight, engraved lines superimposed on the first engraving.

52(Amended). [A] The method according to claim 51, [characterized in that] wherein the lines of the first and second engravings form with each other an angle between 20° and 90°, [in particular] and preferably 40° to 70°.

53(Amended). [A] The method according to [any of claims 44 to 50, characterized in that] claim 44, wherein the partitions [(4)] are produced with flank

angles *[(α)]* in the range of 15° to 60° based on the perpendicular to the printing plate surface [(2)].

54(Amended). [A] The method according to claim 53, [characterized in that] the partitions are produced with flank angles *[(α)]* in the range of 30° to 50°.

55(Amended). [A] The method according to claim 53 [or 54], [characterized in that] including using an engraving tool with a corresponding flank angle *[(α)* is used] for engraving.

56(Amended). [A] The method according to claim 55, [characterized in that] including using a tapered rotating chisel [is used] for engraving.

57(Amended). [A] The method according to [any of claims 44 to 56, characterized in that] claim 44, wherein a first engraving is engraved into the printing plate surface [(2)], and a second engraving is engraved into the printing plate surface [(2)] adjacent to the first engraving so as to leave between the first and second engravings a partition [(4)] tapering at the level of the printing plate surface [(2)] or slightly therebelow.

58(Amended). [A] The method according to [any of claims 44 to 57, characterized in that] claim 44, wherein 2 microns to 5 microns of the printing plate surface material is removed in the engraved area before or after producing partitions [(4)].

59(Amended). [A] The method according to [any of claims 44 to 58, characterized in that] claim 44, wherein the mutual maximum distance *[(d)]* of the partitions [(4)] is smaller than 500 microns.

60(Amended). [A] The method according to claim 59, [characterized in that] wherein the mutual maximum distance *[(d)]* of the partitions [(4)] is 20 microns to 150 microns.

61(Amended). A method according to [any of claims 44 to 60, characterized in that] claim 44, wherein partitions [(4)] with different heights are provided within an engraving.

62(Amended). [A] The method according to [any of claims 44 to 60, characterized in that] claim 44, wherein the engraved area engraved into the printing plate surface [(2)] has an engraving depth in the range of 5 microns to 150 microns.

63(Amended). [A] The method according to claim 62, [characterized in that] wherein the engraving depth is in the range of 10 microns to 60 microns.

64(Amended). [A] The method according to [any of claims 49 to 63, characterized in that] claim 49, wherein the partitions [(4)] form a linear fine structure through their parallel arrangement.

65(Amended). [A] The method according to [any of claims 49 to 64, characterized in that] claim 49, wherein a first fine structure is engraved in at least a first engraved area, and a second fine structure different from the first fine structure is engraved in at least a second engaved area.

66(Amended). [A] The method according to claim 65, [characterized in that] wherein the partitions [(4)] in the first engraved area are produced with a different orientation from the partitions [(4)] in the second engraved area.

67(Amended). [A] The method according to claim 66, [characterized in that] wherein the partitions [(4)] in the first engraved area are aligned at right angles to the partitions [(4)] in the second engraved area.

68(Amended). [A] The method according to [any of claims 65 to 67, characterized in that] claim 65, wherein the first engraved area is engraved with a different engraving depth *[(t)]* from the second engraved area.

69(Amended). [A] The method according to [any of claims 65 to 68, characterized in that] claim 65, wherein the partitions [(4)] in the first engraved area are disposed at a greater maximum mutual distance *[(d)]* than the partitions in the second engraved area.

70(Amended). [A] The method according to [any of claims 65 to 68, characterized in that] claim 65, wherein the partitions [(4)] in the first engraved area are disposed at a greater maximum mutual distance *[(d)]* than the partitions in the second engraved area.

71(Amended). [A] The method according to [any of claims 65 to 70, characterized in that] claim 65, wherein the upper edges [(5)] of the partitions [(4)] in the first engraved area are produced at a greater distance *[(a)]* from the printing plate surface [(2)] than the upper edges [(5)] of the partitions in the first engraved area.

72(Amended). An intaglio printing process for all-over printing of contiguous printed areas using a printing plate [(1)] according to [any of claims 1 to 31] claim 1.

An intaglio printing process for all-over printing of large areas

This invention relates to a printing plate for all-over printing of large areas by the intaglio printing process, to a method for producing the printing plate, and to a data carrier with a large-area printed image produced by the intaglio printing process.

In line intaglio, flat representations are known to be produced by closely adjacent engraved lines, the individual engraved lines normally being fractions of a millimeter wide and separated from each other by unengraved lands.

For the printing operation the engraved lines of the printing plate are filled with ink. Surplus ink is removed from the printing plate with the aid of a wiping cylinder or doctor blade such that the engraved lines are filled with ink up to the edge. The lands separating the engraved lines are cleaned in this operation at the same time.

During printing, finally, the data carrier to be printed, generally paper, is pressed onto the printing plate under high pressure by means of a pressure cylinder having an elastic surface. The data carrier is thereby pressed into the ink-filled engraved lines of the printing plate, thereby coming in contact with the ink. When the data carrier is detached it draws the ink out of the depressions of the engraved lines. The resulting printed image has printed lines which vary in ink layer thickness depending on the depth of the engraving.

If one uses translucent inks in line intaglio one obtains light tones when printing a white data carrier with low ink layer thicknesses, and darker tones when printing with thick ink layers.

In comparison with other common printing processes, the intaglio printing process can produce printed images with very great ink layer thicknesses. The resulting printed images are even perceptible manually if the engravings are deep enough. By using accordingly fine engravings, however, one can also obtain extremely fine and sharp printed lines.

Although the intaglio printing process can produce very high-quality printed images resolved into line structures, it has the disadvantage of not being able to produce large continuous printed areas, i.e. lines with a width of about one millimeter

and more. This is because when the inked printing plate is wiped, not only the surplus ink is removed in the area of large-area engravings but also ink from the engraving. This lowers the ink surface below the surface level of the printing plate in said engraved areas. Since the paper pressed into the engraved areas of the printing plate does not reach the ink surface in all places, gaps arise in the printed image which render the print useless.

The problem of the present invention is therefore to provide measures which permit large-area printed image areas to be printed all over by the intaglio printing process so as to produce a uniform color effect for the viewer.

This problem is solved according to the invention by the features of the independent claims. Developments are to be found in the subclaims.

The invention starts out from the finding that one can prevent ink from being wiped out of the area of the engraving when the printing cylinder or plate is wiped by providing so-called separating lands or partitions in the engraving which prevent or minimize the action of the wiping cylinder on the ink incorporated in the printing plate engraving. It is suspected that the wave of surplus ink pushed over the printing plate surface by the wiping cylinder during wiping draws parts of the ink out of the engraving as well by reason of hydrodynamic effects. The partitions apparently prevent ink in the engraving from being moved within the total volume and entrained with the wave of ink of the wiping cylinder. The partitions thus divide a large-area engraving into contiguous "chambers" or channels which permit ink to be taken out perpendicular to the printing plate surface during printing but not during wiping parallel to the printing plate surface.

The partitions are preferably disposed transversely to the direction of rotation of the printing cylinder. In this arrangement they apparently cause a shearing of the wave of ink during the wiping process and thus a hydrodynamic decoupling of ink in the engraving from the wiping process taking place on the printing plate surface.

In cases where it is not possible to arrange the partitions transversely to the wiping direction, the partitions at least effect a division of large-area engravings, giving them a similar function with respect to wiping out of ink as exists with fine-structured engravings.

Taking the basic inventive idea into account in optimized form, the engraved areas are preferably to be equipped with partitions transversely to the wiping direction. For engraved lines extending along the wiping direction this yields a division of the engraved lines into adjacent partial portions. The engravings extending transversely or diagonally to the wiping direction are divided at least in the longitudinal direction of the engraved line, the partitions preferably extending parallel to the engraving edges.

In cases where the engraving not only consists of very wide engraved lines but also contains large-area engraved elements having similar extensions in the x and y directions, it is also possible to execute the partitions as a screen, i.e. to provide intersecting partitions extending e.g. lengthwise and crosswise with respect to the wiping direction. It is also possible to provide partitions in the form of concentric circles in a honeycomb shape or the like. Such a formation of the partitions not only has the advantage of in any case guaranteeing the function of the partitions independently of the wiping direction, but also ensures that the partitions have increased mechanical stability.

Inventively providing partitions in the engraving of the intaglio printing plate already proves especially advantageous as of an engraved line width greater than 0.5 millimeters. For engraved lines with a width of one millimeter and more they prove to be almost imperative.

The height of the partitions can be varied within a relatively great span, as tests have shown. If the partitions end at the level of the printing plate surface one should make sure that the partition form, viewed in cross section, tapers in a wedge shape. This ensures that the engraving is divided into separate channels or chambers in the optimum form, on the one hand, while the sharp-edged partitions cause no interruption of the printing area, on the other hand.

If one lowers the upper partition edges below the level of the printing plate surface, the cross-sectional form of the partitions can deviate from the wedge form almost at will, i.e. be trapezoid, rounded or a different shape. Since the upper partition edges are always disposed below the level of the printing plate surface in this case

and thus always covered with ink, the production of a continuous printing area is ensured in any case.

It has turned out that when one uses partitions whose upper edges end exactly on the level of the printing plate surface the surface of the wiping cylinder wears out relatively quickly. Lowering the upper partition edge by at least 2 microns to 5 microns eliminates this problem. Such a minimum lowering is in any case recommendable for this reason.

Tests have furthermore shown that much greater lowering of the upper partition edges is also possible. A lowering of up to about 50% below the level of the printing plate surface, based on the engraving depth, is accordingly possible.

It has also turned out that if the partitions have a height (also referred to in the following as amplitude) based on the engraving depth of more than 50%, they cause "notches" in the ink layer surface on the thus produced printing area. Although the printing area produced with such a large-area engraving is printed continuously with ink, it thus has a surface relief caused by the partitions. The surface relief is especially pronounced if the partition amplitude is selected in the range of 75% to 100% of the engraving depth. At lower amplitudes, e.g. in the range of about 60%, this surface relief becomes ever weaker, finally disappearing completely at an amplitude of about 50%. Below the value of 50% one must increasingly expect printing errors in the form of gaps or skips rendering the print useless, particularly with deeper engravings.

Tests have finally shown that engraving depths of 5 microns to about 150 microns are excellent to use according to the invention. The preferred engraving depth found for the production of common printed images was the range of 10 microns to 60 microns. Using customary intaglio printing inks, one thus obtains ink layers with a rather translucent color effect, and even slight changes in engraving depth lead to readily visible changes in tone. Engravings with a depth in the range of about 60 microns to 100 microns are particularly suitable for printing ink layers with a saturated, opaque color effect. The exact values of course vary depending on whether a light or dark color is involved.

Engravings with a depth of 100 microns and more are particularly suitable for producing ink layer structures with a relief readily perceptible to the touch.

The finer the fine structure of the printed area represented by the surface relief is, the less it appears when viewed without aids (magnifying glass). This applies at least to fine structures resulting from partitions with a distance of about 20 microns to 150 microns and a wedge shape. Partitions with a distance of 150 microns to about 400 microns are already recognizable with the naked eye, but in no way disturb the flat general impression of the printed color area. If one uses a trapezoid cross-sectional profile instead of wedge-shaped partitions, the notches in the surface relief become wider, i.e. more areal. Such structures permit a creative influence on the area to be printed since e.g. the screen formed by the partitions also appears as a layout element. If the partitions are not worked into the engraving like a screen but in the form of characters, graphic symbols or the like, these characters or graphic symbols are also recognizable in the printed area.

If one enlarges the partition distance clearly above 500 microns, the above-mentioned printing errors in the form of ink gaps, skips, spots or the like increasingly occur.

Considering that the production of intaglio printing plates is already one of the most elaborate methods for producing printing plates, it is easy to see that additionally providing partitions in the engraving raises considerable additional problems. This holds all the more since not only the form, amplitude and arrangement of the partitions are necessary for the inventive function, but also a precision in the micron range. Such printing plates are not producible manually or by means of etching. The inventive prints and printing plates therefore ensure a high measure of protection against forgery and imitation.

However, such printing plates can be produced by an engraving apparatus from the applicant, as described in WO 97/48555. This apparatus makes it possible to mill intaglio printing plates by computer control. The lines of a two-dimensional linework are detected by a computer and the area of each individual line exactly defined. Using an engraving tool, e.g. a rotating chisel or laser beam, the outside contour of these areas is first engraved to cleanly border the area. Subsequently the bordered

region of the area is cleared out using the same or another engraving tool so that the total line is exactly engraved according to the line original. Depending on the nature and control of the engraving tool one can produce both a certain roughness (instead of a smooth surface) on the base of the engraving, and the inventive partitions with any desired amplitude, different flank angles or precisely given cross-sectional forms. The important thing, as mentioned above, is that the partitions have a minimum amplitude of about 50% of the engraving depth for the inventive function. If this value is fallen clearly short of, ink adheres to the base of the engraving better than with a smooth engraving base, but the abovementioned printing errors are inevitable with large-area engraved elements.

The invention offers completely new possibilities of design for intaglio printing plates. By using engravings printing over large areas it is now possible to produce engraved lines with a width of 1 millimeter to 10 millimeters and more, with ink layer thicknesses of 40 microns and more. One can also realize continuous geometric areas with a size of a few square centimeters by intaglio printing without problem

The fine structure of the printing area can be present both in the form of a screen and in the form of characters or graphic symbols. Even if the coarsest fine structure is selected (with a partition distance in the order of magnitude of 500 microns), it cannot be imitated with any known printing process, which considerably increases the forgery-proofness of accordingly printed data carriers. The fine structure thus proves not only the use of the intaglio printing process, which is already high-quality itself, but also the use of the engraving apparatus described in WO 97/48555, which is not available to any forger because of the high costs.

Further advantages will emerge from the description of the following embodiments.

Figs. 1 to 7 each show details of a printing plate with an engraving in cross section.

Fig. 1 shows a detail of printing plate 1 whose surface 2 is provided with engraving 3 with given depth *t* serving to receive ink. The engravings shown in cross section extend linearly, perpendicular to the paper plane, and are formed so that there are partitions 4 between the parallel depressions, upper partition edges 5 being

at the level of printing plate surface 2. Partitions 4 prevent ink from being wiped out of the depressions formed by engraving 3, on the one hand, and cause a structuring of the ink layer transferred to a substrate, on the other hand. The substrate is printed with ink over the complete area in the region of the engraving.

The offset at which parallel engravings 3 are produced corresponds to distance *d* of upper partition edges 5. In the case shown in Figs. 1 to 3, where the offset of the engraving tool during engraving of depressions 3 corresponds to distance *d* of the upper partition edges, distance *d* is preferably in the range of 20 microns to 150 microns, a distance of about 50 microns being especially preferred for production of fine structures not recognizable without aids.

The modulation of the ink layer thickness produced by the partitions produces in the printed ink layer a fine structure which is not resolved by the naked eye under normal viewing and can therefore serve as a hidden security feature not reproducible either by electrophotography or by other printing processes.

Despite the fine structuring of the printed ink layer, a homogeneous color effect is produced for the human eye. The intensity of the color effect or perceived tone depends on the mean ink layer thickness, and can be adjusted by engraving depth *t* at given flank angle α.

Fig. 2 shows a printing plate in cross section for printing a generally thinner ink layer which produces a lighter tone. The engraved areas of the printing plates shown in Figs. 1 and 2 are equally large and engravings 3 have same flank angle α. By reason of lower engraving depth *t* in Fig. 2 one selects lower distance *d* for the offset of the engraved lines. For printing contiguous color areas it is essential that engraving depth *t* and distance *d* of upper partition edges 5 are selected with consideration of flank angle α such that no flat plateaus arise at the level of printing plate surface 2 within an engraved area.

In Fig. 3 the engraved area has the same extension as in the examples of Figs. 1 and 2. Engraving depth *t* is the same as in Fig. 1. Although partitions 4 have different flank angle β, an ink layer transferred with a printing plate according to Fig. 3 has the same mean layer thickness as one printed with a printing plate according to

Fig. 1. Despite different distance d of partitions 5 and thus the different fine structure, areas with the same tone are printed with the printing plates of Figs. 1 and 3.

However, the printing plates according to Figs. 2 and 3 have same partition distance d and thus produce a fine structure with the same periodicity, but lead by reason of the different flank angles (α, β) to ink layers with different mean thicknesses and different tones.

Engravings 3 are preferably produced with a rotating chisel whose point angle, measured from the center line of the chisel, corresponds to the flank angle of the engraving. The flank angles are preferably in the range of 15° to 60°, the particularly preferred range being 30° to 50°. Mechanical engraving tools have increased life in particular with the preferred point angles. Printing plates with the preferred flank angles can be duplicated more easily by molding techniques and furthermore have especially favorable printing properties. The preferred partition forms (cross sections) are wedge-shaped geometries. However, one can also use any other, in particular wavy or sinusoidal, geometries. The cross-sectional form of partitions 4 is restricted only by the possibilities of designing the contour of an engraving tool.

If the ink layer thickness in the transitional area from a fine-structure line to the adjacent one is to be reduced only to a nonzero value, it is suitable to use structures as shown in Figs. 4 and 5.

An embossing plate according to Fig. 4 is produced by removing the outwardly pointing ends of the partitions after engraving the depressions forming the fine structure. Alternatively, one can first clear in depth a the total area to be provided with an engraving and then engrave the depressions forming the fine structure. This lowers the outwardly pointing ends of the partitions below the level of printing plate surface 2 by value a. The remaining height of the partitions will be referred to as amplitude b in the following, and results from the difference of engraving depth t and partition lowering a. A substrate printed with such a printing plate is provided over the complete area in the region of the engraving with an ink layer having thickness a and additionally modulated with a fine structure having maximum amplitude b. The upper partition ends formed as a plateau in this example produce fine light lines in the printed image. With corresponding guidance of the engraved lines producing parti-

tions 4, the light lines produced in the printed image by trapezoid partitions 4 can render patterns, characters or graphic symbols.

According to the embodiment shown in Fig. 5 one can also obtain partition lowering a by selecting the offset between the individual engraved lines to be so small, at given flank angle α and given engraving depth t, that upper partition edge 5 is below the level of printing plate surface 2.

Partition lowering is advantageous because it prevents the plastic surface of the wiping cylinder from coming in direct contact with sharp-edged partitions 4, thereby reducing wear on both the wiping cylinder surface and the fine engraved structures of the printing plate. Partition lowering a is preferably 2 microns to 5 microns below the level of printing plate surface 2. To ensure a clean rendition of the engraving as a fine structure of the transferred ink layer, amplitude b should be more than 50% of engraving depth t.

Fig. 6 shows a variant of the inventive engraving supplemented with partitions. In this embodiment, partitions 4 are disposed at greater distance d. In contrast to the embodiments of Figs. 1 to 5, partition distance d does not correspond here to the offset of the engraving tool during engraving of the depressions. Distance d is preferably smaller than 500 microns. Horizontal bottom areas 6 of the engraving are provided between partitions 4, having a selectively adjusted surface roughness to improve ink adhesion. Surface roughness is adjusted by the selected geometry of the point angle and point radius of the engraving tool and by setting suitable values for the offset between two engraved lines transversely to the engraving direction.

According to a preferred embodiment of the invention, engraving 3 is incorporated into printing plate surface 2 such that the engraving depth is nonconstant within the engraved area but increases or decreases continuously in one direction (Figs. 7a, 7b). Variation of the engraving depth is preferably effected such that the deepest points of each engraved line are on an inclined plane relative to the printing plate surface. It is also possible to change the engraving depth such that the deepest points lying in a cross-sectional plane of the printing plate are on a curve whose course can be described for example by a parabola or hyperbole. By varying the engraving depth one can vary the perceived tone within a contiguous printed color

area, in particular if the depth variation is effected between 5 microns and 60 microns.

In the embodiment according to Fig. 7a partition distance d and the height of the partitions are constant throughout the engraving, while in the variant according to Fig. 7b the distance and height of the partitions increase with engraving depth ($d_1 > d_2$).

It is possible to combine engravings of different kinds and designs and with different partition forms on one printing plate. One can also make areas with different types of engraving or partition forms adjoin each other, and perform corresponding variations within a self-contained engraved area. Further, one can superimpose a second engraving on a first one. If the first engraving is formed of parallel, preferably straight, engraved lines and the second engraving likewise of parallel, preferably straight, engraved lines, one obtains a so-called cross-line screen. If the lines of the first and second engravings form with each other an angle between 20° and 90°, in particular 40° to 70°, the resulting engraving has especially good ink adhesion, which has a favorable effect on the printing properties of an accordingly engraved printing plate. The ink layers printed therewith furthermore have an especially uniform tone.

The first engraving and superimposed second engraving can be produced with engraving tools of different geometries and with different engraving depths and/or different engraved line offsets. In the case of the preferred cross-line screen, this leads to periodically interrupted partitions.

Patent claims

1. An intaglio printing plate (1) for all-over printing of contiguous printed image areas, the printed image being incorporated into the printing plate surface (2) in the form of an engraving (3), characterized in that partitions (4) are provided in the engraved, ink-receiving areas so as to divide said engraved areas into partial areas, said partitions (4) being designed so as not to have any areas at the level of the printing plate surface.
2. A printing plate according to claim 1, characterized in that the engraved areas are engraved lines and/or large-area engraved elements.
3. A printing plate according to claim 2, characterized in that the engraved lines are wider than 0.5 millimeters, preferably wider than 1.0 millimeter.
4. A printing plate according to any of claims 1 to 3, characterized in that the engraved areas are engraved lines, and the partitions (4) extend transversely to the engraved line so as to form adjacent partial portions, and the partitions (4) extend transversely or diagonally to the wiping direction.
5. A printing plate according to any of claims 1 to 3, characterized in that the engraved areas are engraved lines, and the partitions extend parallel to the engraved line and transversely or diagonally to the wiping direction.
6. A printing plate according to claim 1, characterized in that the partitions (4) are disposed in the engraved area so as to form a uniform fine structure in the form of a screen or regular pattern.
7. A printing plate according to claim 1 or 6, characterized in that the screen is a line screen or cross-line screen.
8. A printing plate according to claim 7, characterized in that the cross-line screen consists of a first engraving with parallel, preferably straight, engraved lines and a second engraving with parallel, preferably straight, engraved lines superimposed on the first engraving.
9. A printing plate according to claim 8, characterized in that the lines of the first and second engravings form with each other an angle between 20° and 90°, in particular 40° to 70°.

10. A printing plate according to any of claims 1 to 9, characterized in that the upper edges of the partitions (4) are disposed at a mutual distance (*d*) which is greater than or equal to the contact width of an engraving tool used for engraving the engraved area.
11. A printing plate according to any of claims 1 to 10, characterized in that the mutual distance (*d*) of the upper edges (5) of the partitions is smaller than 500 microns.
12. A printing plate according to claim 11, characterized in that the mutual distance (*d*) of the upper edges (5) of the partitions (4) is 20 microns to 150 microns.
13. A printing plate according to claim 12, characterized in that the mutual distance (*d*) of the upper edges (5) of the partitions (4) is 50 microns..
14. A printing plate according to any of claims 1 to 13, characterized in that the upper edges (5) of the partitions (4) have a lowering (*a*) of at least 2 microns to 5 microns over the printing plate surface (2).
15. A printing plate according to any of claims 1 to 14, characterized in that the partitions (4) have a partition height (*b*) in the range of 3 microns to 150 microns.
16. A printing plate according to claim 15, characterized in that the partition height (*b*) is in the range of 8 microns and 60 microns.
17. A printing plate according to claim 15 or 16, characterized in that the ratio (*b*:*t*) between partition height (*b*) and engraving depth (*t*) is in the range of 0.5 to 1.
18. A printing plate according to any of claims 1 to 17, characterized in that the engraving depth (*t*) is between 5 microns and 150 microns.
19. A printing plate according to claim 18, characterized in that the engraving depth (*t*) is between 10 microns and 60 microns.
20. A printing plate according to any of claims 1 to 19, characterized in that the partitions (4) have flanks with flank angles (α) in the range of 15° to 60° based on the perpendicular to the printing plate surface (2).
21. A printing plate according to claim 20, characterized in that the partitions (4) have flanks with flank angles (α) in the range of 30° to 50°.

22. A printing plate according to any of claims 1 to 21, characterized in that the partitions (4) form a linear fine structure through their parallel arrangement.
23. A printing plate according to claim 22, characterized in that the printing plate (1) is adapted for use with a printing cylinder such that the linear fine structure is substantially parallel to the rotation axis of the printing cylinder.
24. A printing plate according to any of claims 1 to 23, characterized in that both the length and the width of the engraved area are more than one millimeter.
25. A printing plate according to any of claims 1 to 24, characterized in that at least a first engraved area and a second engraved area are provided which differ by different designs of the partitions (4) and/or partition arrangements.
26. A printing plate according to claim 25, characterized in that the partitions (4) in the first engraved area have a different orientation from the partitions (4) in the second engraved area.
27. A printing plate according to claim 26, characterized in that the partitions (4) in the first engraved area are aligned at right angles to the partitions (4) in the second engraved area.
28. A printing plate according to any of claims 25 to 27, characterized in that the first engraved area has a different engraving depth (*t*) from the second engraved area.
29. A printing plate according to any of claims 25 to 28, characterized in that the upper edges (5) of the partitions in the first engraved area have a greater mutual distance (*d*) than the upper edges (5) of the partitions in the second engraved area.
30. A printing plate according to any of claims 25 to 29, characterized in that the upper edges (5) of the partitions in the second engraved area have a greater distance (*a*) from the printing plate surface (2) than the upper edges (5) of the partitions in the first engraved area.
31. A printing plate according to any of claims 25 to 30, characterized in that the first and second engraved areas adjoin each other.
32. A data carrier with a printed image produced by the intaglio printing process and comprising at least one printed image area having an ink layer and a surface

area of more than one square millimeter, the at least one ink layer covering the complete printed image area, characterized in that the lateral dimensions such as length and width of the area are greater than 0.5 millimeters, and the ink layer has along one direction at least one notch on which the ink layer thickness passes through a minimum.

33. A data carrier according to claim 32, characterized in that the lateral dimensions such as length and width of the area are greater than one millimeter.

34. A data carrier according to claim 32 or 33, characterized by a surface relief of the at least one ink layer, the surface relief having a fine structure with regularly recurring structural elements.

35. A data carrier according to claim 34, characterized in that the structural elements recur at a distance smaller than 0.5 millimeters.

36. A data carrier according to claim 34 or 35, characterized in that the fine structure forms a screen or regular pattern.

37. A data carrier according to claim 36, characterized in that the screen is a line screen or cross-line screen.

38. A data carrier according to claim 36 or 37, characterized in that the fine structure forms a screen wherein the line width is less than 150 microns.

39. A data carrier according to any of claims 34 to 38, characterized by at least a first printed image area with a first fine structure and a second printed image area with a second fine structure different from the first fine structure.

40. A data carrier according to claim 39, characterized in that the first and second printed image areas represent one or more characters or a picture.

41. A data carrier according to claim 39 or 40, characterized in that the fine structure of the first printed image area has a different orientation from the fine structure of the second printed image area.

42. A data carrier according to any of claims 39 to 41, characterized in that the fine structures of the first and the second printed image areas differ by different line widths.

43. A data carrier according to any of claims 39 to 42, characterized in that the first and second printed image areas differ by different ink layer thicknesses.

44. A method for producing an intaglio printing plate (1) for all-over printing of a large area by the intaglio printing process comprising the steps of:
    - providing a printing plate with a printing plate surface (2), and
    - engraving at least one engraved area corresponding to the large area to be printed into the printing plate surface (2) by means of an engraving tool so as to leave partitions (4) rising up in the engraved area and dividing the engraved area into partial areas, the partitions (4) being designed by the engraving so as not to have any areas at the level of the printing plate surface (2).
45. A method according to claim 44, characterized in that the engraved areas are engraved as engraved lines and/or large-area engraved elements.
46. A method according to claim 45, characterized in that the engraved lines are wider than 0.5 millimeters, preferably wider than 1.0 millimeter.
47. A method according to any of claims 44 to 46, characterized in that the engraved areas are engraved as engraved lines, and the partitions (4) extend transversely to the engraved line so as to form adjacent partial portions, and the partitions extend transversely or diagonally to the wiping direction.
48. A method according to any of claims 44 to 46, characterized in that the engraved areas are engraved as engraved lines, and the partitions are formed parallel to the engraved line and extend transversely or diagonally to the wiping direction.
49. A method according to claim 44, characterized in that the partitions (4) form a uniform fine structure in the form of a screen or regular pattern.
50. A method according to claim 49, characterized in that the screen is a line screen, dot screen or cross-line screen.
51. A method according to claim 50, characterized in that the cross-line screen is formed of a first engraving with parallel, preferably straight, engraved lines and a second engraving with parallel, preferably straight, engraved lines superimposed on the first engraving.

52. A method according to claim 51, characterized in that the lines of the first and second engravings form with each other an angle between 20° and 90°, in particular 40° to 70°.

53. A method according to any of claims 44 to 50, characterized in that the partitions (4) are produced with flank angles (α) in the range of 15° to 60° based on the perpendicular to the printing plate surface (2).

54. A method according to claim 53, characterized in that the partitions are produced with flank angles (α) in the range of 30° to 50°.

55. A method according to claim 53 or 54, characterized in that an engraving tool with a corresponding flank angle (α) is used for engraving.

56. A method according to claim 55, characterized in that a tapered rotating chisel is used for engraving.

57. A method according to any of claims 44 to 56, characterized in that a first engraving is engraved into the printing plate surface (2), and a second engraving is engraved into the printing plate surface (2) adjacent to the first engraving so as to leave between the first and second engravings a partition (4) tapering at the level of the printing plate surface (2) or slightly therebelow.

58. A method according to any of claims 44 to 57, characterized in that 2 microns to 5 microns of the printing plate surface material is removed in the engraved area before or after producing partitions (4).

59. A method according to any of claims 44 to 58, characterized in that the mutual maximum distance (d) of the partitions (4) is smaller than 500 microns.

60. A method according to claim 59, characterized in that the mutual maximum distance (d) of the partitions (4) is 20 microns to 150 microns.

61. A method according to any of claims 44 to 60, characterized in that partitions (4) with different heights are provided within an engraving.

62. A method according to any of claims 44 to 60, characterized in that the engraved area engraved into the printing plate surface (2) has an engraving depth in the range of 5 microns to 150 microns.

63. A method according to claim 62, characterized in that the engraving depth is in the range of 10 microns to 60 microns.

64. A method according to any of claims 49 to 63, characterized in that the partitions (4) form a linear fine structure through their parallel arrangement.

65. A method according to any of claims 49 to 64, characterized in that a first fine structure is engraved in at least a first engraved area, and a second fine structure different from the first fine structure is engraved in at least a second engraved area.

66. A method according to claim 65, characterized in that the partitions (4) in the first engraved area are produced with a different orientation from the partitions (4) in the second engraved area.

67. A method according to claim 66, characterized in that the partitions (4) in the first engraved area are aligned at right angles to the partitions (4) in the second engraved area.

68. A method according to any of claims 65 to 67, characterized in that the first engraved area is engraved with a different engraving depth (t) from the second engraved area.

69. A method according to any of claims 65 to 68, characterized in that the partitions (4) in the first engraved area are disposed at a greater maximum mutual distance (d) than the partitions in the second engraved area.

70. A method according to any of claims 65 to 68, characterized in that the partitions (4) in the first engraved area are disposed at a greater maximum mutual distance (d) than the partitions in the second engraved area.

71. A method according to any of claims 65 to 70, characterized in that the upper edges (5) of the partitions (4) in the first engraved area are produced at a greater distance (a) from the printing plate surface (2) than the upper edges (5) of the partitions in the first engraved area.

72. An intaglio printing process for all-over printing of contiguous printed areas using a printing plate (1) according to any of claims 1 to 31

Abstract

Printing plates for all-over printing of large areas by the intaglio printing process, a method for producing the printing plates and data carriers, in particular bank notes, with large-area printed images produced by the intaglio printing process are proposed. Flawless inking is ensured by providing partitions in the engraving of the printing plate which rise up vertically from the base of the engraved area and have at least a height of 50% of the engraving depth. The partitions largely prevent ink from being wiped out of the engraved areas when ink is wiped off the printing plate surface. This permits a large printed area to be covered all over with ink layers on a data carrier. By special arrangement and design of the partitions one can also produce fine structures in the printing area which are recognizable only with magnifying aids depending on the selected distances between the partitions.

FIG.1

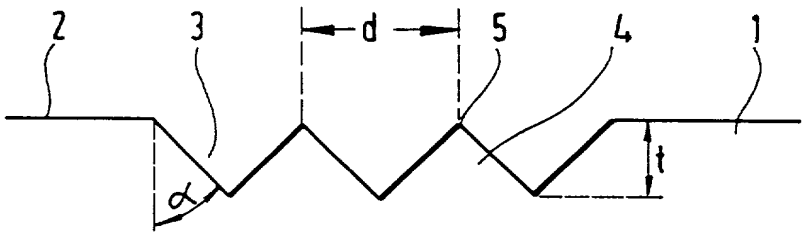


FIG.2

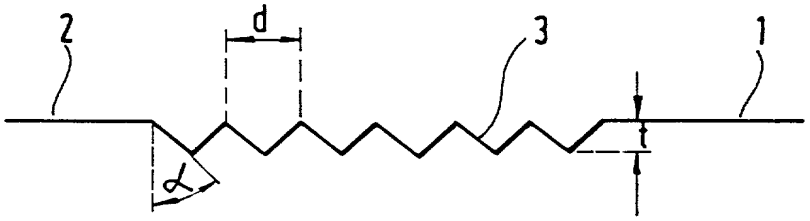


FIG.3

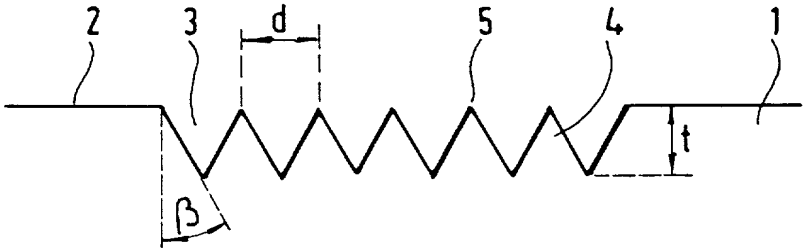


FIG. 4

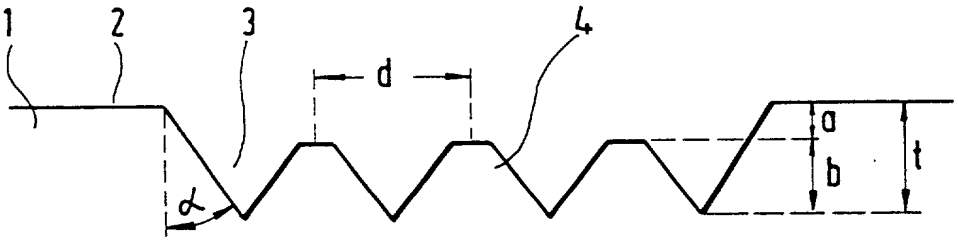


FIG. 5

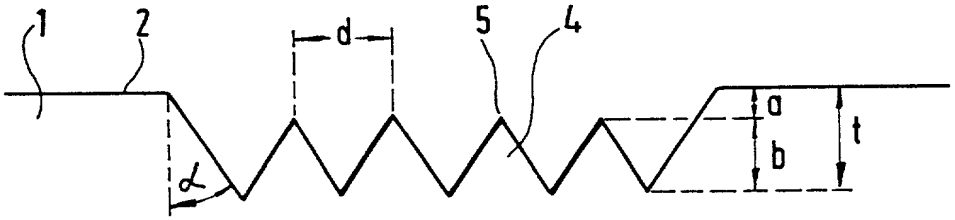


FIG. 6

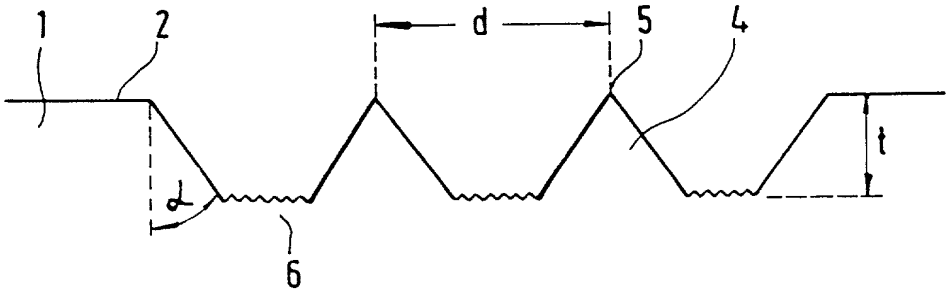


FIG. 7a

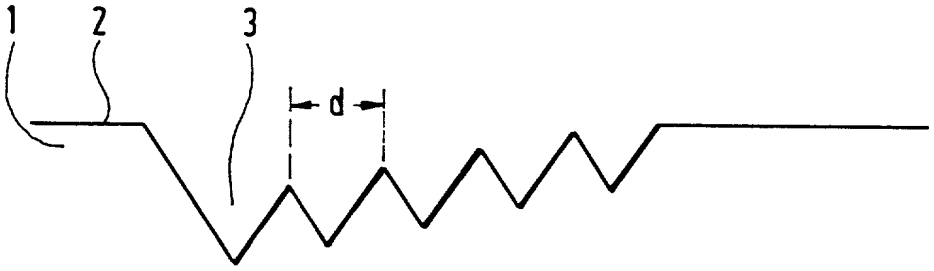
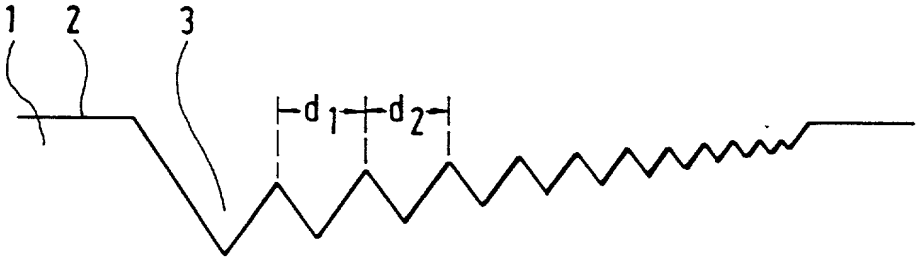


FIG. 7b



ATTORNEY/DOCKET NO: **MAYE3001/JEK**

DECLARATION FOR PATENT APPLICATION AND APPOINTMENT OF ATTORNEY

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name; I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention (Design, if applicable) entitled:

GRAVURE PROCESS FOR FULL PRINTING OF LARGE SURFACES

the specification of which (check one):

☐ is attached hereto, or ☒ was filed on: **29 September 1999** as U.S. Application Number or PCT International Application Number: **(PCT/EP99/07217) 09/787,920**

and (if applicable) was amended on:

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment(s) referred to above. I acknowledge the duty to disclose information which is material to patentability as defined in *Title 37, Code of Federal Regulations, §1.56.* I hereby claim foreign priority benefits under *Title 35, United States Code §119* of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

PRIOR FOREIGN APPLICATION(S)			PRIORITY CLAIMED	
Number	**Country**	**Day/Month/Year Filed**	**Yes**	**No**
198 45 440.6	Germany	02 October 1998	X	

☐ Additional Priority Application(s) Listed on Following Page(s)

I HEREBY CLAIM THE BENEFIT UNDER TITLE 35 U.S. CODE §119(E) OF ANY U.S. PROVISIONAL APPLICATIONS LISTED BELOW.	
Application Number	**Day/Month/Year Filed**

☐ Additional Provisional Application(s) Listed on Following Page(s)

I hereby claim the benefit under *Title 35, United States Code, §120* of any United States application(s) or PCT international application(s) designating The United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of *Title 35, United States Code, §112*, I acknowledge the duty to disclose information which is material to patentability as defined in *Title 37, Code of Federal Regulations, §1.56* which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

Application Number	Filing Date	Status - Patented, Pending or Abandoned

☐ Additional US/PCT Priority Application(s) listed on Following Page(s)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under *section 1001 of title 18 of the United States Code* and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: I (We) hereby appoint as my (our) attorneys, with full powers of substitution and revocation, to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: J. Ernest Kenney, Reg. No. 19,179; Eugene Mar, Reg. No. 25,893; Richard E. Fichter, Reg. No. 26,382; Thomas J. Moore, Reg. No. 28,974; Joseph DeBenedictis, Reg. No. 28,502; Benjamin E. Urcia, Reg. No. 33,805; and

I(we) authorize my(our) attorneys to accept and follow instructions from **Klunker, Schmitt-Nilson, Hirsch** regarding any matter related to the preparation, examination, grant and maintenance of this application, any continuation, continuation-in-part or divisional based thereon, and any patent resulting therefrom, until I(we) or my(our) assigns withdraw this authorization in writing.

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☒ *See following page(s) for additional joint inventors.*

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CONTINUATION OF DECLARATION FOR PATENT APPLICATION AND APPOINTMENT OF ATTORNEY

PRIOR FOREIGN APPLICATION(S) (35 USC §119)			PRIORITY CLAIMED	
Number	**Country**	**Day/Month/Year Filed**	**Yes**	**No**

PRIOR PROVISIONAL APPLICATIONS 35 U.S. CODE §119(E)	
Application Number	**Day/Month/Year Filed**

PRIOR U.S. OR PCT INTERNATIONAL APPLICATIONS (35 U.S. CODE §120)		
Application Number	**Filing Date**	**Status - Patented, Pending or Abandoned**

2-00

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